

CLAIMS

1. A constant-current circuit that generates a plurality of constant currents and outputs the generated
5 constant currents, comprising:

a first transistor that generates a current corresponding to a signal input to a control electrode and outputs the generated current;

a first pn junction element to which the current
10 output from the first transistor is supplied;

a second transistor that generates a current corresponding to a signal input to a control electrode and outputs the generated current;

a first series circuit in which a first resistor
15 and a second pn junction element are connected in series and to which the current output from the second transistor is supplied;

a control circuit that controls the operation of the first and the second transistors so that a voltage of a
20 connection point of the second transistor with the first resistor is equal to that of a connection point of the first transistor with the first pn junction element; and

a proportional current generating circuit that generates a plurality of currents the currents being
25 proportional to a current flowing in the first resistor;

wherein

the first resistor is connected to a potential difference generated by a difference of current densities flowing in the first and the second pn junction elements,
5 the proportional current generating circuit consists of a plurality of transistors for generating proportional current to whose control electrodes a control signal output from the control circuit to the second transistor is input, and a current proportional to a current flowing in the
10 first resistor is generated in each of the transistors for generating proportional current and the generated current is output.

2. The constant-current circuit as claimed in
15 claim 1, wherein

the control circuit is an operational amplification circuit to whose corresponding input terminals the voltage of the connection point of the second transistor with the first resistor and the voltage of the
20 connection point of the first transistor with the first pn junction element are respectively input, and the operation of the first and the second transistors and the transistors for generating proportional current is controlled by the operational amplification circuit.

3. The constant-current circuit as claimed in claim 1, wherein

the first resistor has a temperature characteristic that offsets a temperature characteristic of a potential difference generated by a difference of current densities flowing in the first and the second pn junction elements.

4. The constant-current circuit as claimed in claim 1, further comprising:

a third transistor that generates a current corresponding to a signal input from the control circuit to a control electrode and outputs the generated current; and

a second series circuit in which a second resistor and a third pn junction element are connected in series and to which the current output from the third transistor is supplied;

wherein

a voltage of a connection point of the third transistor with the second resistor is output as a predetermined reference voltage.

5. The constant-current circuit as claimed in claim 4, wherein

each resistance value and each temperature

coefficient of the first and the second resistors are set respectively so that a variation of the reference voltage caused by the temperature characteristic of a voltage at both ends of the third pn junction element is offset.

5

6. The constant-current circuit as claimed in claim 1, wherein

the first and the second transistors are MOS transistors whose sources are connected to each other and
10 whose gates are connected to each other, and the transistors for generating proportional current are MOS transistors whose sources are connected to the sources of the first and the second transistors and whose gates are connected to the gates of the first and the second
15 transistors.

7. The constant-current circuit as claimed in claim 4, wherein

the first through the third transistors are MOS
20 transistors whose sources are connected to each other and whose gates are connected to each other, and the transistors for generating proportional current are MOS transistors whose sources are connected to the sources of the first through the third transistors and whose gates are
25 connected to the gates of the first through the third

transistors.

8. A system power source providing a plurality of constant-voltage circuits that generate predetermined
5 voltages and output the generated voltages to corresponding loads comprising:

a constant-current circuit that generates a plurality of constant currents and outputs the generated constant currents to the corresponding constant-voltage
10 circuits as bias currents;

wherein

the constant-current circuit includes a first transistor that generates a current corresponding to a signal input to a control electrode and outputs the
15 generated current; a first pn junction element to which the current output from the first transistor is supplied; a second transistor that generates a current corresponding to a signal input to a control electrode and outputs the generated current; a first series circuit in which a first
20 resistor and a second pn junction element are connected in series and to which the current output from the second transistor is supplied; a control circuit that controls the operation of the first and the second transistors so that a voltage of a connection point of the second transistor with
25 the first resistor is equal to that of a connection point

of the first transistor with the first pn junction element;
and a proportional current generating circuit that
generates a plurality of currents the currents being
proportional to a current flowing in the first resistor;

5 wherein the first resistor is connected to a
potential difference generated by a difference of current
densities flowing in the first and the second pn junction
elements, the proportional current generating circuit
consists of a plurality of transistors for generating
10 proportional current to whose control electrodes a control
signal output from the control circuit to the second
transistor is input, and a current proportional to a
current flowing in the first resistor is generated in each
of the transistors for generating proportional current and
15 the generated current is output.

9. The system power source as claimed in claim 8,
wherein

the control circuit is an operational
20 amplification circuit to whose corresponding input
terminals the voltage of the connection point of the second
transistor with the first resistor and the voltage of the
connection point of the first transistor with the first pn
junction element are respectively input, and the operation
25 of the first and the second transistors and the transistors

for generating proportional current is controlled by the operational amplification circuit.

10. The system power source as claimed in claim 8,
5 wherein

the first resistor has a temperature characteristic that offsets a temperature characteristic of a potential difference generated by a difference of current densities flowing in the first and the second pn junction
10 elements.

11. The system power source as claimed in claim 8,
wherein

the constant-current circuit further comprises: a
15 third transistor that generates a current corresponding to a signal input from the control circuit to a control electrode and outputs the generated current; and a second series circuit in which a second resistor and a third pn junction element are connected in series and to which the
20 current output from the third transistor is supplied;

wherein a voltage of a connection point of the third transistor with the second resistor is supplied to at least one of the constant-voltage circuits as a predetermined reference voltage.

12. The system power source as claimed in claim 11, wherein

each resistance value and each temperature coefficient of the first and the second resistors are set
5 respectively so that a variation of the reference voltage caused by the temperature characteristic of a voltage at both ends of the third pn junction element is offset.

13. The system power source as claimed in claim 8,
10 wherein

the first and the second transistors are MOS transistors whose sources are connected to each other and whose gates are connected to each other, and the transistors for generating proportional current are MOS
15 transistors whose sources are connected to the sources of the first and the second transistors and whose gates are connected to the gates of the first and the second transistors.

20 14. The system power source as claimed in claim 11, wherein

the first through the third transistors are MOS transistors whose sources are connected to each other and whose gates are connected to each other, and the
25 transistors for generating proportional current are MOS

transistors whose sources are connected to the sources of the first through the third transistors and whose gates are connected to the gates of the first through the third transistors.